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ABSTRACT

The manual provides information about the development of auditory communication training for hearing impaired students. Two models of auditory training are reviewed: the Model Secondary School for the Deaf, which posits five areas of training, including awareness, attention, identification/recognition, message analysis, and comprehension/integration; and the Kendall Demonstration Elementary School which covers detection, discrimination, identification, and comprehension. Sample auditory communication activities are described for the above named topic areas, with information on objectives, equipment, teacher preparation, and instruction. A section on equipment addresses advantages and disadvantages of hardware amplifier systems, radio frequency systems, induction loop systems, and portable auditory training systems. Use of tape recorders, record players, and audiocard readers is considered. Guidelines for equipment operation and maintenance are offered. Finally, a list of equipment manufacturers and a bibliography of eight references conclude the manual. (CL)

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Developing Auditory Skills

A Guide to Auditory Communication Activities

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The first edition of this book, *A Guide to Auditory Communication Activities*, was developed and written by the following team:

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This revised edition provides an opportunity to update the text and manufacturer's information and to provide an additional model of auditory skills.

The present edition was revised under the direction of Judith W. Marvich and Norman Lederman.

Developing Auditory Skills

A Guide to Auditory Communication Activities

The Model Secondary School for the Deaf
Gallaudet College
Washington, D.C.

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Introduction

Communication is essential for an individual to interact with others and the environment. Of the many integrative skills involved in successful communication, reacting to auditory stimuli within the environment is a particularly important one. A hearing impaired individual encounters difficulty in communicative situations requiring this skill.

Committed to the philosophy of Total Communication,* the Model Secondary School for the Deaf (MSSD) and the Kendall Demonstration Elementary School (KDES) provide severely and profoundly hearing impaired students the opportunity to improve their skills in various communication modes. Through training in auditory communication, students can increase the amount of information which hearing contributes to their total perception.

Auditory communication training requires the cooperative effort of students, content teachers, audiologists, and speech pathologists. This manual is an example of such a cooperative effort. The manual provides the following information about the development of auditory communication activities:

- Two models of auditory skills
- Information on various types of equipment useful in auditory communication activities
- A representative listing of equipment manufacturers
- Guidelines for planning auditory communication activities
- A set of sample communication activities

* The Conference of Executives of American Schools for the Deaf (CEASD) defines Total Communication as a philosophy incorporating appropriate aural, manual, and oral modes of communication in order to ensure effective communication with and among hearing impaired persons.

Models of Auditory Skills

The human auditory system receives and processes acoustic signals; this permits the natural acquisition of language. Auditory processing requires sorting acoustic signals and giving them meaning. Physiological evidence shows that the auditory system becomes more complex as it moves from the cochlea, where signals are received, to the cortex, where meaning is assigned (Sanders, 1977). Several educators, audiologists, speech pathologists, and psychologists have formulated instructional models based on this evidence (Falck, 1973; Flowers and Costello, 1970; Hardy, 1965; Regan, 1973; Sabatino, 1969; Semel, 1976).

A hearing impaired individual does not receive as many acoustic signals as a normally hearing individual. Therefore, the acquisition of the English language is difficult for the severely and profoundly hearing impaired individual. Early fitting and continual use of amplification increases the number of acoustic signals received. Although the use of amplification increases the number of acoustic signals received by a hearing impaired individual, the processing of the information from the acoustic signals may require training. Because there has been little research conducted on the specific processing abilities of a hearing impaired individual, strategies for auditory training have been based on instructional models for a normally hearing individual.

The staffs at MSSD and KDES have developed two models of auditory skills based on physiological evidence of the increasing complexity of the auditory processing system. These models are used as a basis for identifying skills of an individual student and for developing training activities to supplement curricula in different content areas.

The MSSD Model

The MSSD model is divided into five areas, which are both hierarchical and integrative.

AWARENESS serves as the auditory system's link to the environment and is the basis for more complex processing. Awareness involves the ability to detect the presence of sound and to locate the source of sound.

ATTENTION requires the listener to focus on the communicative aspects of a sound signal such as pitch, loudness, duration, rhythm, stress, number, and sequence. These aspects may be learned in any sequence. However, the general ability to attend to characteristics of sound signals must be mastered before the signal can be further processed by the learner.

IDENTIFICATION/RECOGNITION includes identifying familiar stimuli and recognizing similarities and differences among signals. This level includes the ability to differentiate speech from nonspeech stimuli.

MESSAGE ANALYSIS involves the integration of different skills. Generally, message analysis includes discrimination among auditory patterns; storage and retrieval of a message; figure/ground establishment; use of prosodic and suprasegmental cues; and feedback.

Discrimination among auditory patterns (from phonemes to syllables, words, phrases, and sentences) requires a degree of linguistic competence and an analysis of a signal's intensity, frequency, and transitional cues.

Storage and retrieval of a message involve short- and long-term memory. Short-term memory receives the spoken message; long-term memory allows a student to process the message by giving the message a linguistic structure.

Figure/ground establishment is the ability to pick out a primary signal from background noise and to focus on and identify that signal.

Use of prosodic or suprasegmental cues requires knowledge of intonational and inflectional aspects of language and the sequencing of the acoustic patterns of a signal or message. Sequencing involves remembering the order of the separate parts of a message and discriminating among the parts and/or the entire message.

Feedback is the ability to recognize errors in the message itself or in the listener's interpretation of the message.

COMPREHENSION/INTEGRATION is the ability to understand a message by using all the information from the preceding levels and applying appropriate linguistic rules. This comprehension is translated to other modalities—visual, motor, or tactile. For example, one common comprehension/integration task is listening to and carrying out directions.

The KDES Model

An alternative model of auditory skills developed and used at Kendall Demonstration Elementary School (KDES) is divided into four major skills areas. These areas are slightly broader than the areas defined in the MSSD model.

DETECTION is the ability to perceive the presence or absence of an auditory stimulus.

DISCRIMINATION is the perception of similarities and/or differences among auditory stimuli. The skill is not identifying the stimuli, but rather perceiving their similarities or differences.

IDENTIFICATION is the ability to perform a naming task in a closed response set. This skill requires association of the presented auditory stimulus with its representation.

COMPREHENSION is the ability to produce a response that reflects an understanding of a stimulus, but which is not a direct representation of that stimulus.

Auditory Communication Activities

Auditory communication activities can be conducted with live voice or recording equipment. The difficulty of each activity is increased or decreased by adding or deleting visual cues (signs, pictures, or lip movements). Speech production as a response may be required if a student is comfortable with it.

Auditory communication activities may be developed using material from any content area when a student is familiar with the concepts and vocabulary. These activities are appropriate for use in individual or small group instruction. When correct responses are provided, a student may work independently.

The activities on the following pages are examples of those developed and tested at MSSD. All skills listed in the MSSD model are represented by specific sample activities with the exception of figure/ground discrimination and self-monitoring. Figure/ground discrimination is tested in an activity by presenting the stimulus in the presence of competing noise. A student's self-monitoring skill is tested in an activity by asking the student to recognize his or her errors when responding to stimuli.

Many factors may affect a severely or profoundly hearing impaired student's performance on auditory communication activities. These factors (Figure 1) should be considered when selecting and implementing specific activities.

Figure 1. Factors in Selecting and Implementing Auditory Communication Activities

Student-related Factors

- Etiology, severity, and configuration of hearing loss
- Age
- Length and quality of exposure to amplified sound
- Stage of linguistic development
- Motivation

Stimuli-related Factors

- Vocabulary
- Syntax
- Intensity (volume) of presentation
- Rate of presentation

Environment-related Factors

- Signal-to-noise ratio
- Addition or deletion of visual and vibro-tactile cues
- Distance between sound source and student
- Sound quality of recorded material
- Condition of amplification system and instructional equipment

AWARENESS: Recognizing the Presence of Sound

Objective	Identify the presence of sound
Equipment	Audiocard reader Audiotape cards
Teacher Preparation	Record one sound (environmental sound, musical note or measure, word, etc.) on each of several audiotape cards. Mix in a number of blank cards. Prepare a worksheet with columns headed 'sound' and 'no sound.'
Instruction	Have the student listen to each audiotape card. Ask the student to place a check in the appropriate column to indicate whether he or she has heard a sound.
Reference	Erber, 1976

ATTENTION: Number

Objective	Identify the number of sounds
Equipment	Audiocard reader Audiotape cards
Teacher Preparation	Record a number of pure tones, animal sounds, or environmental sounds on each of several audiotape cards. Vary the number of tones recorded from one to seven. Prepare a worksheet with a blank line next to each item number.
Instruction	Have the student listen to each card. Tell the student to decide how many tones he or she hears and to write the number in the space on the worksheet.

ATTENTION: Duration

Objective Identify the duration of a sound stimulus

Equipment Audiocard reader
Audiotape cards

Teacher Preparation Prepare several sets of audiotape cards in the following manner:

Record one word, phrase, or sentence on each of three cards. Vary the length of the recording on each card. Number the cards 1, 2, and 3. Place the cards in an envelope.

Optional: Prepare a worksheet with numbers 1, 2, and 3 next to each item number.

Instruction Have the student listen to each set of audiotape cards. Tell the student to indicate which card has the longest (or shortest) recording by either pointing to it or by circling the appropriate card number on the worksheet.

ATTENTION: Pitch

Objective Identify the pitch range for a given musical note or chord

Equipment Musical instrument with a wide range of pitch, such as a piano

Teacher Preparation Prepare three cards labeled 'high,' 'medium,' and 'low.'

Instruction Have the student listen to a note or chord played in one of the three ranges. Ask the student to decide the pitch range for the note or chord. Tell the student to point to the appropriate card (high, medium, or low).

ATTENTION: Pitch/Sequence

Objective	Identify the pitch sequence for a series of musical notes or chords
Equipment	Musical instrument with a wide pitch range, such as a piano
Teacher Preparation	Prepare several cards labeled 'high,' 'medium,' and 'low.'
Instruction	Have the student listen to a series of notes or chords played in the various pitch ranges (e.g., high, low, medium, high; or low, low, high, medium). Tell the student to indicate the pitch sequence of the notes or chords by placing the labeled cards in the order heard.

ATTENTION: Stress

Objective	Identify the stress pattern in a spoken word
Equipment	Audiocard reader Audiotape cards
Teacher Preparation	Prepare a list of monosyllabic, trochaic, and spondaic words. Record one word per audiotape card. Mix the cards. Prepare a worksheet on which the student may check the correct response to each item.
Instruction	Have the student listen to each card. Ask the student to check the stress pattern heard in each word. Do not ask the student to identify each word.

IDENTIFICATION/RECOGNITION: Speech vs. Non-speech Stimuli

Objective Identify a sound stimulus as speech or non-speech

Equipment Audiocard reader
Audiotape cards

Teacher Preparation Record a word or phrase on a number of audiotape cards. Record environmental sounds on other cards. Mix the two sets of cards. Prepare a worksheet with columns headed 'speech' and 'not speech.'

Instruction Have the student listen to each card. Ask the student to place a check in the correct column on the worksheet to indicate whether the sound was speech or non-speech stimuli.

IDENTIFICATION/RECOGNITION: Same/Different Speech Stimuli

Objective Identify pairs of spoken words as the same or different

Equipment Audiocard reader
Audiotape cards

Teacher Preparation Record a pair of identical or different words on each of a number of audiotape cards, pausing between the words. Indicate the pause by notching the cards into segments, drawing a line, or using another visual cue. Prepare a worksheet with columns headed 'same' and 'different.'

Instruction Have the student listen to each pair of words. Ask the student to indicate whether the words are the same or different by placing a check in the correct column on the worksheet.

Reference Erber, 1976

IDENTIFICATION/RECOGNITION: Identification of Speech Stimuli

Objective	Identify a spoken word
Equipment	Audiocard reader Audiotape cards
Teacher Preparation	Prepare a worksheet listing 10 to 20 pairs of words. Record one word from each pair on an audiotape card. Number the cards to correspond with the worksheet items.
Instruction	Ask the student to listen to each card and to look at the corresponding worksheet item. Tell the student to circle the word heard on the audiotape card.

MESSAGE ANALYSIS: Discrimination

Objective	Identify rhyming words
Equipment	Audiocard reader Audiotape cards
Teacher Preparation	Record three words, two of which rhyme, on each audiotape card. Prepare a worksheet with the numbers 1, 2, and 3 next to each item number.
Instruction	Have the student listen to each audiotape card. Tell the student to decide which words rhyme. Ask the student to circle the numbers of the words which rhyme for each item.

MESSAGE ANALYSIS: Discrimination of Speech Stimuli

Objective — Identify the word used to complete a sentence

Equipment — Audiocard reader
Audiotape cards

Teacher Preparation — Prepare several sets of audiotape cards in the following manner:

Record a complete sentence on the first card. Print the sentence on the card, leaving a blank in place of the final word. On a second card, record a set of three words (pausing between them), one of which is the final word in the sentence. Prepare a worksheet with three word choices for each item.

Instruction — Have the student listen to the complete sentence. Then, ask the student to read the incomplete printed sentence and listen to the alternative word choices. Tell the student to select the word used to complete the sentence and to circle it on the worksheet.

MESSAGE ANALYSIS: Memory, Discrimination

Objective — Sequence words presented in a spoken sentence

Equipment — Audiocard reader
Audiotape cards

Teacher Preparation — Record a sentence on each of a number of audiotape cards. Create 'sentence puzzles' by typing or printing each recorded sentence on an index card. Cut each sentence into separate words. Place each sentence puzzle with its audiotape card in an envelope.

Instruction — Have the student listen to each audiotape card. Ask the student to arrange the pieces of the sentence puzzle in the order presented.

MESSAGE ANALYSIS: Prosodic Cues

Objective	Identify emotion expressed in a spoken phrase or sentence
Equipment	None
Teacher Preparation	Prepare a list of phrases and sentences which can be expressed using a variety of emotions.
Instruction	Present the phrases and sentences to the student using facial expression and body language. Ask the student to name the emotion expressed. Repeat the activity using auditory cues only.

MESSAGE ANALYSIS: Prosodic Cues

Objective	Discriminate between spoken statements and questions
Equipment	Audiocard reader Audiotape cards
Teacher Preparation	Record a statement on each of several audiotape cards. Record a question on each of several audiotape cards. Mix the two sets of cards into one stack. Prepare a worksheet with columns headed 'statement' and 'question.'
Instruction	Have the student listen to each audiotape card. Tell the student to indicate whether he or she hears a statement or question by placing a check in the correct column.

COMPREHENSION/INTEGRATION

Objective	Identify synonyms or antonyms
Equipment	Audiocard reader Audiotape cards
Teacher Preparation	Record three words per audiotape card. Two of the words should be antonyms or synonyms. Number the cards. Prepare a worksheet with two blank lines next to each number.
Instruction	Have the student listen to each audiotape card. Tell the student to write the words which are antonyms or synonyms.

COMPREHENSION/INTEGRATION

Objective	Identify the appropriate word to complete a spoken analogy
Equipment	Audiocard reader Audiotape cards
Teacher Preparation	On each of a number of audiotape cards, record an analogy omitting the final word (e.g., milk is to drink as apple is to . . .). Prepare a worksheet with three word choices for each item.
Instruction	Have the student listen to each card. Ask the student to complete the analogy by circling the correct word on the worksheet.

COMPREHENSION/INTEGRATION

Objective	Answer spoken questions requiring a yes/no response
Equipment	Audiocard reader Audiotape cards
Teacher Preparation	Prepare a list of questions requiring a yes/no answer. Questions must have only one correct answer (i.e., Do birds fly?). Record one question per card. Prepare a worksheet on which the student may circle the correct answer to each question.
Instruction	Ask the student to listen to each question and to answer by circling the correct response on the worksheet. If desired, ask the student to write the question.

Equipment

Equipment used in auditory communication activities is divided into two distinct categories: amplification equipment (auditory training systems and personal hearing aids) and instructional equipment.

AUDITORY TRAINING SYSTEMS

Auditory training systems make maximum use of a student's residual hearing and offer advantages usually not found in personal hearing aids.

Advantages of Auditory Training Systems

- Improved signal-to-noise ratio
- Better sound quality (less distortion, wider frequency response)
- Flexibility in using external inputs (tape recorders, phonographs, etc.)

Auditory training systems may be classified into four types: hardwire, portable (desk amplifiers), loop, and radio frequency (RF).

Most audio and video equipment (including standard headphones) is not capable of providing sufficient output levels for the student with a severe or profound hearing loss. Additional amplification provided by portable or hardwire auditory trainer amplifiers (with suitable high-output headphones) provides the student with a higher quality signal at a more appropriate level. In addition, auditory trainer amplifiers contain a circuit that suppresses excessively high levels that could be either painful to the listener or cause damage to the headphones. With many auditory training systems, maximum output, gain, left/right balance, and frequency response may be tailored to suit the needs of the individual student. In some situations specially constructed systems may be more appropriate than conventional auditory training systems. When buying any equipment the considerations should include budget, environment, objectives, and procedures.

A hardwire amplifier system with 'speech table.'

HARDWIRE AMPLIFIER SYSTEM

The conventional hardwire amplifier system provides a microphone for the teacher and microphones and headphones for the students. The microphones and headphones are connected to a central location, usually the teacher's lectern, containing a 'compression amplifier' that maintains a fixed volume preset by the teacher. Individual headphones are adjustable.

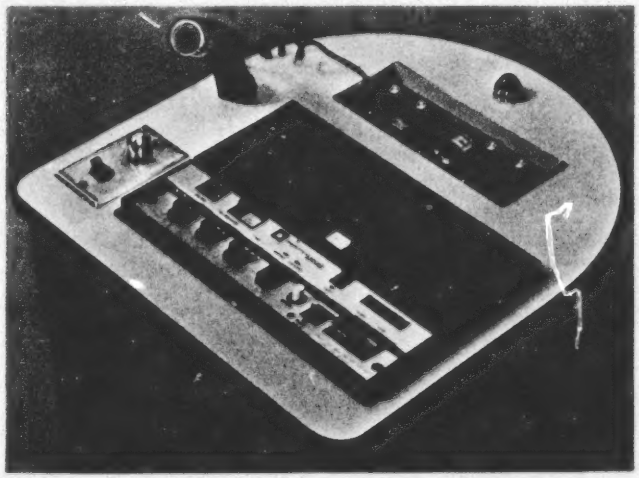
Advantages of the Hardwire Amplifier System

- Excellent sound quality reproduction
- Suitable for groups larger than four
- Immunity to external interference
- Flexibility in using the audio output of additional equipment (e.g., audio- and/or videotape playback machines)

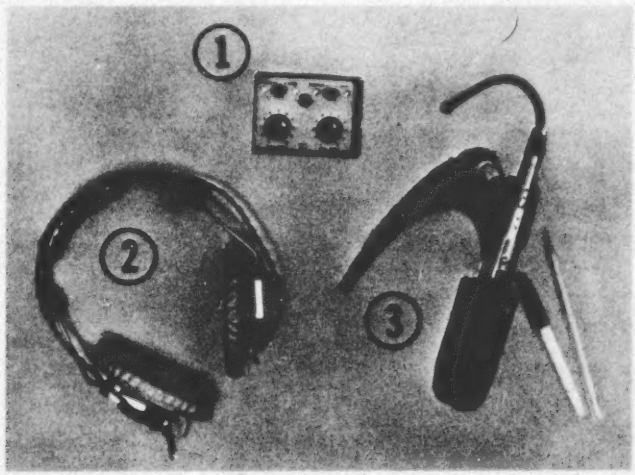
Disadvantage of the Hardwire Amplifier System

- Limited mobility for teacher and students by the headphones, connecting wires, and power cord

Teacher's lectern in a hardwire amplifier system: 1) Microphone, 2) Compression amplifier, 3) Cassette recorder.



Student's equipment in a hardwire amplifier system: 1) Headphone control, 2) High-Output headphones, 3) Microphone.

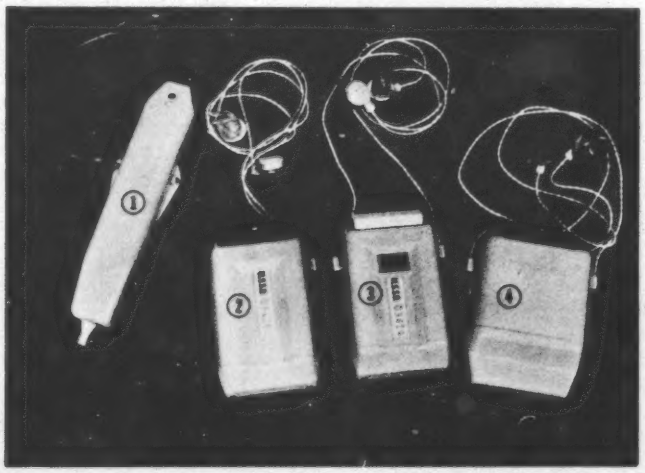


RADIO FREQUENCY (RF) SYSTEM

Since the majority of high-quality radio frequency (RF) auditory training systems are the frequency modulation (FM) variety, this section will refer only to the FM system.

In the FM system, the teacher's microphone transmits the signal to the receiver worn by a student. FM auditory trainers are available in FM only or FM/microphone models. With the FM/microphone model, a student's receiver incorporates one or two microphones and monaural or binaural amplification of environmental sounds in addition to FM reception of the teacher's microphone.

An FM radio frequency system: 1) Teacher's transmitter microphone, 2) Student's receiver/FM only, 3) Student's receiver/FM monaural microphone, 4) Student's receiver/FM binaural microphones.



Advantages of the Radio Frequency System

- Excellent sound quality
- Freedom of movement throughout the instructional area
- Flexibility in selecting instructional areas
- No 'spillover' to and from nearby systems (This is prevented by using selective transmitter/receiver channels.)
- Availability of monaural or binaural environmental amplification in combination with the teacher's transmission
- Portable

Disadvantages of the Radio Frequency System

- Large initial investment
- Potentially high maintenance costs (Student- and teacher-worn units are more susceptible to damage than less mobile systems.)
- Need to recharge battery-operated units after use

INDUCTION LOOP SYSTEM

In the induction loop system, the teacher's microphone is connected to an amplifier that generates a magnetic field through wiring installed around the room. The magnetic field is detected and amplified by either a student's personal hearing aid (switched to the telephone mode) or a special body receiver provided with the system.

The placement of the induction loop is important; the manufacturer's installation instructions should be followed carefully.

Advantages of the Induction Loop System

- Economical
- Wireless
- Compatible with a student's personal hearing aid (in the telephone or microphone/telephone mode)
- Freedom of movement throughout the looped area

Disadvantages of the Induction Loop System

- Susceptibility to external interference (e.g., fluorescent lighting, machinery, nearby radio stations, etc.)
- Possibility of 'spillover' to and from adjacent classrooms
- Inconsistent sound level if distance from the student to loop varies (This can be minimized by careful installation of the loop.)

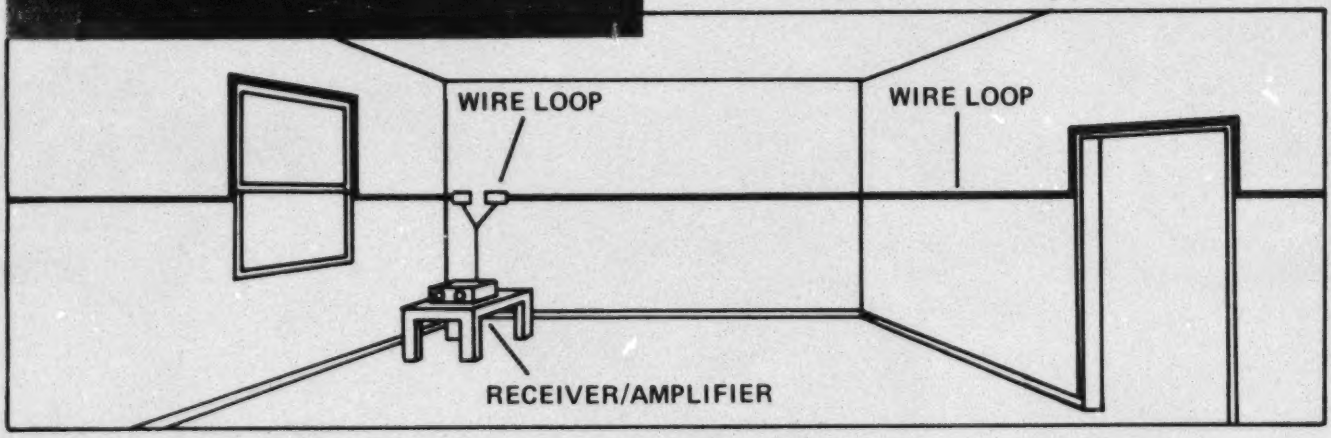


Diagram of an induction loop system. Insert: A small experimental, portable induction loop system.

PORTABLE AUDITORY TRAINING SYSTEM

With a portable auditory training system, a student receives auditory information via a compact desk amplifier and high-output headphones. Portable auditory training systems are usually powered by built-in rechargeable batteries. Generally this type of system is only used for one-to-one instruction. Some models will accommodate up to four headphones.

A portable auditory training system may use an external teacher's microphone or internal monaural or binaural microphones. The system that uses an internal microphone is similar in function to a personal hearing aid and is consequently subject to the same environmental considerations.

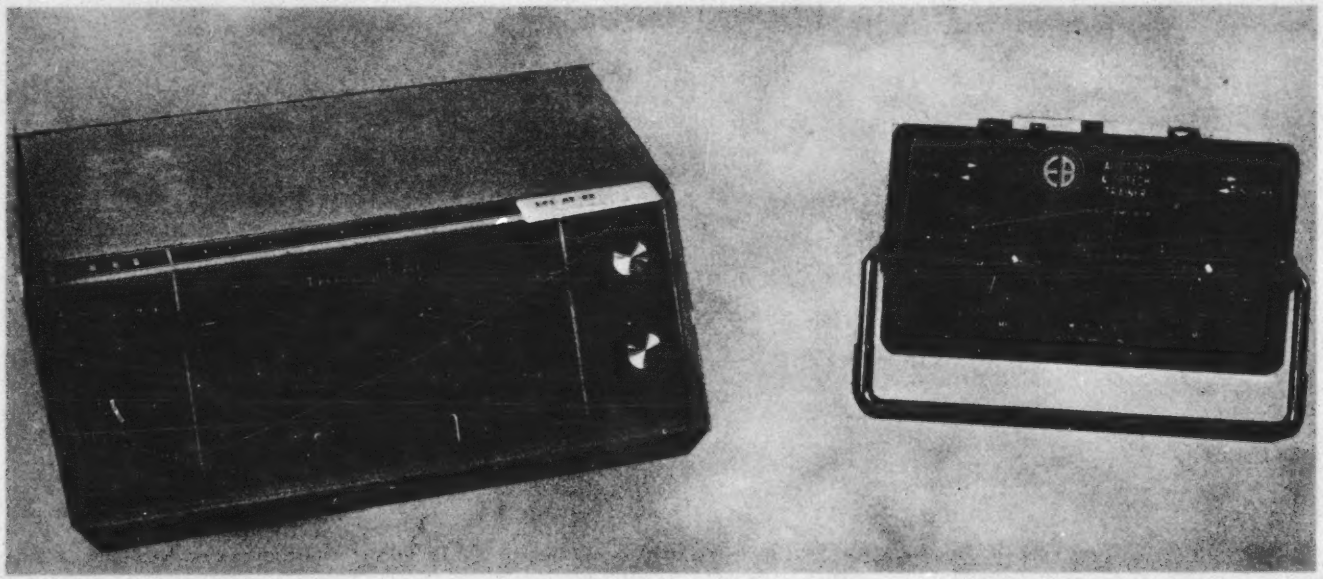
Advantages of the Portable Auditory Training System

- Portability and flexibility in selecting instructional areas
- Excellent sound quality reproduction
- Immunity to external interference
- Flexibility in using the audio output of additional equipment (e.g., audio- and/or videotape playback machines

Disadvantages of the Portable Auditory Training System

- Limited mobility for teacher and students by the headphones and connecting wires
- Need to recharge unit after each use

Portable auditory trainer amplifiers.

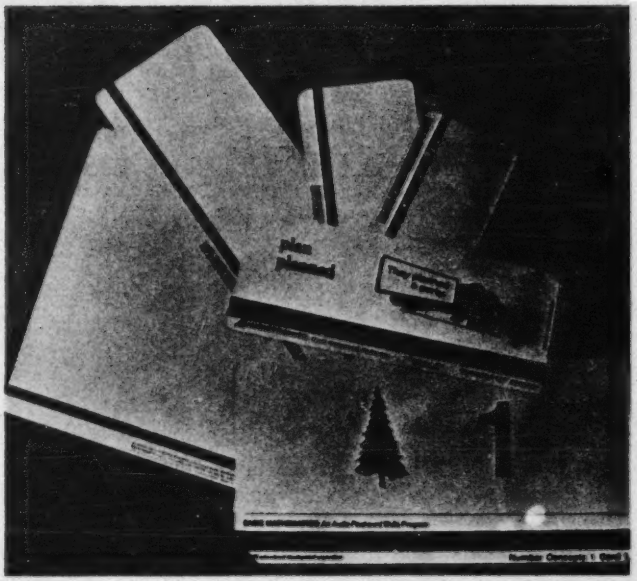


INSTRUCTIONAL EQUIPMENT

The instructional equipment described in this section is useful only with appropriate teacher supervision. Examples of equipment used for the auditory communication activities are audiocard readers, tape recorders, and record players.

AUDIOCARD READERS

Audiocard readers are very similar to tape recorders; sound is recorded and played back using audio (magnetic) tape. Instead of the tape being wound onto reels, cartridges, or cassettes, a short length of tape is permanently bonded to a stiff paper card. These cards are available in different sizes, pre-recorded or blank, and with or without illustrations or words printed on the side facing the student. The audiocard is inserted into the audiocard reader for playing or recording. Generally, two tracks are recorded on each card; one track for instructor use and one track for student response.



Audiocards in a variety of sizes, blank and pre-recorded.

Audiocard reader machines.

TAPE RECORDERS

For material of short duration (six seconds or less), audiocard readers are a convenient medium. For longer material, cassette and reel-to-reel tape recorders are often used. Tape recorders with counters are convenient for locating desired sections of tape.

Reel-to-reel and cassette tape recorders.

RECORD PLAYERS

A conventional stereo system may be used for presenting materials and performing localization activities. The system's loudspeaker 'balance' control can direct the sound out of either loudspeaker, as desired by the instructor. Phonograph records require more care than tapes, and tapes are generally more convenient to use. It is usually more convenient to locate particular sounds (e.g., sound effects) on records and transfer them to tape. This method gives the instructor more freedom in arranging the material.

A stereo system used for sound localization. The student indicates direction of sound as the teacher manipulates the stereo balance control.

GUIDELINES FOR EQUIPMENT OPERATION AND MAINTENANCE

The successful implementation of auditory communication activities is dependent on several variables:

- Method of recording materials
- Presentation of materials
- Condition and care of equipment
- Environmental conditions

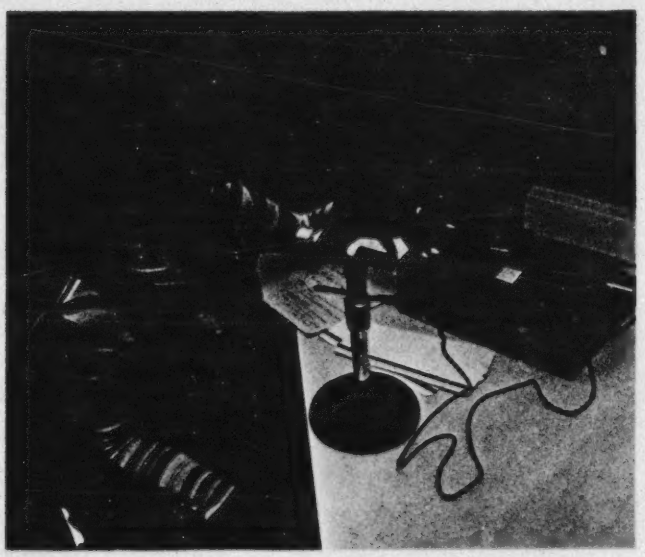
RECORDING MATERIALS

The built-in microphone found in all audiocard readers and many cassette recorders is susceptible to mechanical vibration resulting in noisy, poor fidelity recording. To improve the quality of recorded materials, use an external, unidirectional (cardioid) microphone when recording materials. Use a tabletop stand to hold the microphone in a fixed position and to free hands for operating equipment. Speak at a normal conversational level six to eight inches from the microphone. The unit's automatic record-gain control will normally prevent overload distortion. Adjust the microphone distance if playback volume is distorted or too low.

Some audiocard readers and tape recorders offer a half-speed feature that doubles the maximum record/playback time. The resulting degradation of frequency response, however, makes half-speed operation undesirable when high-quality reproduction is required.

PRESENTING THE MATERIALS

Audio materials may be presented through headphones, hearing aid receivers, or loudspeakers. Additional (external) amplification is recommended for presenting recorded materials through high-output headphones. A



Recording with an external, unidirectional (cardioid) microphone.

Presenting materials (via audiocards or the teacher's microphone) through an auditory trainer amplifier.

hardwire or portable auditory training system is ideal for this purpose. The operator's manual, supplied with the auditory training system, should be consulted for details on connecting external equipment.

For aided, free-field activities, the student's hearing aid is used and the audio material is presented through a loudspeaker at conversational level (approximately 60 dB). This level can be achieved by most recording equipment with built-in loudspeakers. If the material is to be presented to a group larger than four, additional amplification and a larger loudspeaker may be required.

CONDITION AND CARE OF INSTRUCTIONAL EQUIPMENT

When using any equipment be aware of normal system operation so that problems will be recognized if they occur. A basic routine equipment check should include the following steps.

- Listen to each auditory training system for excessive noise and sound distortion.
- Check headphones and connecting cords, moving the cord from side to side while playing a tape or providing other constant input. Repair or replace faulty cords.
- Check all volume controls and switches. Clean 'scratchy' controls and faulty switches with T.V. contact cleaner.
- Repair or replace cracked cases and broken parts.

To achieve consistent results and optimum quality with audiocard readers and tape recorders, follow these procedures:

- After 10 hours of use (or earlier if sound loses clarity), clean audiocard readers with the special cleaning card available from the manufacturer. Follow instructions given in the operator's manual. For tape recorders, use a cotton swab lightly moistened with denatured alcohol to clean all parts that come in contact with tape (tape guides, heads, rubber pinch rollers, etc.). Refer to the operator's manual for additional information.
- Store recorded materials in a cool, dry environment, away from stray magnetic fields (for example, tape erasers, magnets, etc.). Do not store audiocards with the magnetic strips facing each other.

ENVIRONMENTAL CONDITIONS

Environmental conditions directly affect communication development and the communication skills of hearing impaired students. Optimum environmental conditions are crucial in instructional areas. Equipment can make an instructional area more functional for communication or can be rendered useless under adverse environmental conditions.

A hearing impaired student should have direct visual access to the teacher and other students. Adequate lighting is necessary for all instructional activities.

When personal hearing aids or auditory trainers with built-in microphones are used in an instructional setting, the ideal distance from the speaker is within two feet. In a less than ideal environment, systems using an external teacher's microphone are recommended for maximum signal-to-noise ratio.

Equipment Manufacturers

AUDIOCARD READERS

Audiotronics
7428 Bellaire Avenue
North Hollywood, California 91605

Bell & Howell
Audio-Visual Products Division
7100 North McCormick Road
Chicago, Illinois 60645

Califone International, Inc.
5922 Bowcroft Street
Los Angeles, California 90016

SYSTEM DESIGN

Center for Communications Research
50 West Main Street
Rochester, New York 14614

HIGH-OUTPUT HEADPHONES

Telephonics
770 Park Avenue
Huntington, New York 11743

Telex Communications, Inc.
9600 Aldrich Avenue, South
Minneapolis, Minnesota 55420

Jay L. Warren, Inc.
721 W. Belmont Avenue
Chicago, Illinois 60652

AUDITORY TRAINER AMPLIFIERS

Portable System
(with built-in rechargeable batteries)

Electronic Futures, Inc.
857 North Main Street
Wallingford, Connecticut 06492

Eckstein Brothers, Inc.
4807 West 118th Place
Hawthorne, California 90250

Guinta Associates
67 Leuning Drive
South Hackensack, New Jersey 07606

FM Radio Frequency System

Earmark, Inc.
449 Putnam Avenue
Hamden, Connecticut 06517

HC Electronics
520 Camino Alto
Mill Valley, California 94941

Telex Communications, Inc.
9600 Aldrich Avenue, South
Minneapolis, Minnesota 55420

Hardwire System

Precision Acoustics Industries, Inc.
55 West 42nd Street
New York, New York 10036

Jay L. Warren, Inc.
721 W. Belmont Avenue
Chicago, Illinois 60652

Induction Loop System

Hal-Hen Company
36-14 Eleventh Street
Long Island City, New York 11106

Precision Acoustics Industries, Inc.
55 West 42nd Street
New York, New York 10036

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